



## News Releases

### Study Reveals Two Distinct Stages of Deep Sleep Using Mobile Sleep Monitoring Devices

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SAN DIEGO - A recently published study co-authored by a scientist from the Naval Health Research Center (NHRC) sought to improve methods used to score sleep quality. In doing so, researchers identified two distinct stages of deep sleep based on dominant frequency and concurrent electrodermal activity (EDA). Researchers also found that capturing sleep data using low-profile, in-home monitoring devices provided a powerful and cost-effective technique to quickly assess sleep architecture and, potentially, overall sleep quality. The study was published online in *Frontiers in Human Neuroscience*.

The study evaluated 51 participants during three nights of sleep over a two-week period, using mobile 2-channel electroencephalogram (EEG) recording devices and subjective reports of sleep quality. Sleep EEG was collected from 2 forehead leads, with ground and reference leads behind the ears. The mobile devices allowed researchers to collect high quality data while participants slept in the comfort of their own homes, allowing more natural sleep and reducing costs associated with overnight monitoring in a sleep lab.

Researchers reviewed EEG data using an intuitive spectral display that enabled easy visualization of whole-night sleep architecture, as well as a display with tiny dots corresponding to the dominant frequency of brain activity over the course of the night. Additionally, EDA was simultaneously recorded during sleep to determine which sleep stages were most associated with changes in EDA activity.

Analysis of study data allowed researchers to detect two physiologically distinct deep sleep states, which they have designated Hi and Lo Deep sleep according to the dominant frequency being above or below 1 Hz. Researchers found that EDA was primarily associated with Lo Deep sleep and rarely with Hi Deep or any other stage. The study suggests that the balance of time spent between Hi and Lo Deep sleep may indicate the extent to which various critical neural processes occur during sleep. Based on study findings, the absence of Lo Deep sleep in particular may indicate serious problems with brain health.

Study authors suggest that future research should investigate whether brain processes known to be associated with deep sleep, such as clearance of waste products through brain shrinkage and cerebral spinal fluid flux or the release of growth hormone, are associated with Hi or Lo Deep sleep exclusively. Additionally, authors suggest research studies to explore sleep complaints related to various conditions ranging from psychological stress to aging as they may be due to skewed ratios of Hi/Lo Deep sleep.

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